COURSE #: CHE 485 (1 credit)	**COURSE TITLE:** Chemical Engineering Process Economics
TERMS OFFERED: Winter	**PREREQUISITES:** CHE 343: Separation Processes
TEXTBOOKS/REQUIRED MATERIAL: Turton, R., Bailie R.C., Whiting, W. B., Shaeiwitz, J.A., Analysis, Synthesis, and Design of Chemical Processes, 2nd Edition, Prentice Hall	**COGNIZANT FACULTY:** Lin, Schwank, Tadd, Wang, Hirshfield
INSTRUCTORS: Schwank	**FACULTY APPROVAL:** 2019-11-05
CoE BULLETIN DESCRIPTION: Economic and profitability analysis as applied to chemical engineering processes and products. Estimation of capital investment, cost of production, depreciation, and cash flows. Discounted profitability analysis including net present value, internal rate of return and discounted payback period. Profitability decision making based on cost of capital and economic risk analysis. ChE process optimization based on economic profitability. Students will connect economics and business principles to real chemical engineering processes, as previously learned in the core chemical engineering courses of fluid mechanics, heat and mass transfer, and separations.	**COURSE TOPICS:** 1. Estimation of capital investment, cost of production, depreciation charges and cash flows of a chemical engineering process. 2. Discounted profitability analysis including net present value, internal rate of return and discounted payback period as applied to ChE processes. Also apply discounting methods to perform incremental analysis and replacement analysis. 3. Introduction to corporate financial structure including weighted average-cost of capital 4. Economic risk analysis including risk-adjusted cost of capital (hurdle rate), sensitivity and scenario analysis, decision tree analysis, expected net present value and real options. 5. Process optimization based on process economics including rules of thumb for ChE unit operations.
COURSE STRUCTURE/SCHEDULE: Lecture: ½ term, 2 per week, 1 hour	
COURSE OBJECTIVES	Links shown in brackets are to course outcomes that satisfy these objectives. 1. To provide a conceptual and methodological framework for evaluating the cost, revenue, profitability, and risk of ChE processes and products.
COURSE OUTCOMES	Links shown in brackets are to ABET student outcomes 1-7. a. Estimate the capital investment, cost of production, depreciation, and cash flows of chemical engineering processes [2]. b. Make decisions about the profitability of chemical engineering processes by applying discounted profitability analysis including net present value, internal rate of return and discounted payback period [2,6]. c. Analyze the economic risk of a chemical engineering process by means of sensitivity, scenario, and decision tree analysis as well as calculation of expected net present value [1,2,4]. d. Explain how optimization of a chemical engineering process based on profitability yields simple rules of thumb for the design of chemical engineering processes [2].
ASSESSMENT TOOLS	1. Homework problems assess outcomes a-d 2. One midterm exam assesses outcomes a-c 3. End-of-term course evaluation provides student self-assessment of outcomes a-d.